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ABSTRACT

This publication can be used as: a guide for improving, expanding, and balancing the existing energy and resource conservation education program; a resource for planning appropriate inservice education activities in energy and resource conservation education for school district personnel; and a source of information for locating high quality curricular materials, background information, and community resources. It consists of seven chapters which focus on, respectively: (1) energy and resource conservation in the curriculum (examining components and outcomes related to lifelong learning skills, concepts and understandings, and ethical behavior); (2) energy and resource conservation in the course of study (with excerpts from school district philosophies, program philosophies, program goals, and with suggestions for constructing a model course of study); (3) choosing energy and resource conservation activities; (4) teaching strategies; (5) planning inservice programs and types of inservice actvities; (6) using nonschool resources (including local resources, stage agency resources, state organizations, national organizations, and federal agencies); and (7) summary information. Appendices include biographical sketches of individuals who have made a contribution to envrionmental/conservation education and lists of curriculum and other types of resources. (JN)

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FOREWORD

Ohio's educators have traditionally worked hard to provide the best possible education for their students. The activity to improve education in Ohio during the past several years has been remarkable. Public and nonpublic schools have made great strides in implementing the Minimum Standards for Elementary and Secondary Schools.

Numerous teachers and administrators have commented on the utility of the Ohio Department of Education's implementation series consisting of fourteen documents that have been available since 1983. These publications have been found to be a great help in designing educational programs that not only meet the requirements of standards, but enable schools to consider various ways in which to provide quality education.

As educators continue to seek to provide excellence throughout their programs, there have been many inquiries about other parts of the standards not addressed by the implementation series. The department has identified areas of most common concern and has prepared this leadership series consisting of nine documents. As was the case with most of the documents in the original implementation series, the leadership series serves to specify the requirements of standards. Additional information, guidelines, procedural steps, and sample forms may be presented that go beyond what the standards require. The purpose is to provide information to help schools plan to meet their needs and provide the best possible education for their students.

The assistance of school personnel who contributed their time, expertise, and materials is greatly appreciated. Recognition and sincere thanks are extended to the department staff members who worked to make these publications possible.

Franklin B. Walter

Franklin B. Walter
Superintendent of Public Instruction

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INTRODUCTION

INTRODUCTION

• *Priority*

The Ohio Department of Education has considered energy and resource conservation a priority since 1939. In that year the Department of Education and the Ohio Department of Natural Resources cooperatively employed the first conservation education consultant who was responsible for assisting school districts in improving and expanding the energy and resource conservation learning activities for Ohio's boys and girls.

The intervening forty-six years have produced outstanding programs which have brought Ohio to the forefront of environmental education in the nation. Highly motivated educators have initiated new programs and expanded existing programs to provide these essential experiences for Ohio's students.

The importance of a high quality energy and resource conservation program is reinforced by the results of national polls. Since the early 1970s Americans have consistently indicated that environmental issues are at or near the top of their priorities and concerns. The increase in membership and financial support for environmentally oriented groups further substantiates the need for a well-planned and vigorously implemented K-12 energy and resource conservation education program.

• *Purpose*

This publication is designed to provide school district personnel with creative ideas, suggested procedures and usable information that will enable them to meet and go beyond the elementary and secondary school standards requirement that:

> Courses of study shall provide for the following topics to be a part of the curriculum...energy and resource conservation education...

Although many school district personnel have recognized the importance of a comprehensive energy and resource conservation program, this publication will provide a basis for determining if a program adequately addresses all the components and interrelationships that are essential to a quality program.

INTRODUCTION

- *Uses*

Superintendents, curriculum directors, principals, teachers, and districtwide K-12 energy and resource conservation education committee members can use this publication in three ways:

1. as a guide for improving, expanding, and balancing the existing energy and resource conservation education program;
2. as a resource for planning appropriate inservice education activities in energy and resource conservation education for school district personnel; and
3. as a source of information for locating high quality curricular materials, background information, and community resources.

Many Ohio educators with experience in energy and resource conservation education have helped in the development of this publication. That practical input should make it easy to use in putting together an excellent K-12 energy and resource conservation education program.

CURRICULUM

CHAPTER I

ENERGY AND RESOURCE CONSERVATION IN THE CURRICULUM

Definition

Energy and resource conservation education is that part of education which investigates, analyzes, and promotes understanding of the total environment and the complex interdisciplinary environmental issues which affect the lives of every world inhabitant today and in the future.

Because of the many issues and the interconnectedness involved in energy and resource conservation, the logical method of study would be holistic or interdisciplinary. That approach, however, may be unmanageable in many curricular frameworks. Therefore, in this publication the whole has been divided into seven components to make it possible for curriculum committees to plan activities and units that will be compatible with many different curricular frameworks. The seven components are

1. energy
2. food and fiber
3. population
4. land use
5. goods and services
6. environmental quality
7. resource use

These seven components are described in detail on pages 15-19.

Justification

John J. Audubon — Hugh Hammond Bennett — David Brower — John Burroughs — Reynold Carlson — Rachel Carson — John Chapman — Barry Commoner — Jacques Yves Costeau — Joseph Wood Crutch — Charles Arthur Dambach — William O. Douglas — Black Elk — Ralph Waldo Emerson — M. L. Fergeson — Robert Finlay — Kahlil Gibran — Donald R. Hammerman — Garret Hardin — Herbert Hoover — Kenneth Hunt — Thomas Jefferson — Carl Johnson — Chief Joseph — E. V. Jotter — Aldo Leopold — George Perkins Marsh — W. J. McGee — Donella and Dennis Meadows — Ruth Melvin — John Muir — Gaylord Nelson — Frederick Law Olmsted — Sigard Olson Gifford Pinchot — John Wesley Powell — Ralph Ramey James Ranier — Thomas Rillo — Franklin Delano Roose-

LIFELONG LEARNING SKILLS

velt — Theodore Roosevelt — Chief Seattle — L. B. Sharp Paul Allen Siple — Julian Smith — John Thompson — Henry David Thoreau — Rolling Thunder — Stewart Udall — Walt Whitman

Lists of people who have affected public policy, public awareness, and citizen education in energy and resource conservation include many different individuals from different times. Each made specific contributions yet each staunchly supported the idea that our environment must not be mistreated. They realize that if our natural resources were abused, we would eventually destroy or at least substantially damage the capability of our planet to sustain for us a satisfactory life support system.

Appendix A, beginning on page 51 contains thirty-five biographical sketches selected from those persons listed above. Each sketch indicates the major contributions of the individual, his or her life span, and one or more references for further information.

These people have written and spoken eloquently about the need for all citizens to know and understand the natural environment and/or the complex environmental issues that affect us all. They also have recognized the need for citizens to take an active part in the formation of public policy at local, state, national, and world levels. Equally important, these leaders saw clearly the need for individuals to develop an ethical framework to guide everyday personal decisions that could contribute to the development of a sustainable and aesthetically pleasing environment.

A comprehensive elementary and secondary education program would not be complete if the knowledge, skills, attitudes, and values commonly associated with energy and resource conservation were not a prominent component of the curriculum. A well-constructed program in energy and resource conservation substantially enhances the attainment of lifelong learning skills, the development of concepts and understandings about environmental issues, and the internalization of an environmental ethic.

Components and Outcomes—Lifelong Learning Skills

The critical need for elementary and secondary educators to facilitate the development of lifelong learning skills in students is well documented. More and more school districts are placing a greater emphasis on this aspect of education. As a result, more questions are being raised about the limits on what will fit into the curriculum. This frustration can be reduced by recognizing that environmental issues and concerns inherently require the application of lifelong learning skills in their understanding. Consequently, a comprehensive energy

LIFELONG LEARNING SKILLS

and resource conservation education program accomplishes both objectives at the same time.

It should be kept in mind that the lifelong learning skills are the primary goal. The specific environmental issue or concern is the means by which the lifelong learning skills can be developed. This fact allows a school district committee to select environmental issues or concerns that are pertinent to the local area as well as those that have a state, national, or global impact.

The eight lifelong learning skills listed below have purposely been described first in this publication to emphasize their primary importance. Because the development of these skills in students is so critical, great care must be taken to plan carefully for their acquisition by students. These skills are too important and complex to be left to serendipitous development.

Many lists of lifelong learning skills have been published. This list is a compilation and condensation that will illustrate the wide range of skills involved.

• thinking skills	observing, classifying, predicting, inferring, hypothesizing, interpreting
• decision-making skills	recognizing the need for a decision, identifying alternatives, analyzing positive and negative alternatives, examining values, making decisions
• valuing skills	clarifying, analyzing, moral reasoning
• problem-solving skills	identifying, defining, information gathering, organizing, generating alternatives, developing plans, implementing plans, evaluating outcomes
• communications skills	speaking, writing, listening, discussing
• psychomotor skills	manipulating equipment, eye-hand coordination, kinesthetic sense

LIFELONG LEARNING SKILLS

• mathematical skills	computing with whole numbers, representing data, solving problems
• interpersonal relations skills	cooperating, compromising, developing group discussion skills, improving leadership skills

To illustrate how environmentally oriented activities can develop these skills, the following examples are offered.

Improving observation skills

Witnesses of crimes or automobile accidents often have a great deal of difficulty in describing what they have seen. So, too, students have difficulty giving verbal or written descriptions of what they see, smell, hear, taste, or feel. A planned K-12 sequence of activities to improve this skill is needed. Because energy and resource conservation activities reqiure learner involvement, they hold the interest of students at all levels. Careful observation of birds or other animals in their natural habitat improves the detail and accuracy of oral or written descriptions. One activity called the six S's of animal observation focuses on developing this skill.

A six-columned paper has the headings of shape, size, sound, surroundings, sustenance (food), and shelter. Students are encouraged to use sketches and written descriptions in the appropriate columns as they observe the animal. With peer and teacher input, the detail and accuracy will improve with each repetition. When groups of three or four students work cooperatively, communication skills will also improve. It is easy to let the identification of the animal become the primary objective—that tendency should be resisted. The primary objective should be the improvement of observational skills.

Literally hundreds of activities could be planned for improving observational skills: observing the activity at a strip mine, observing the results of salt brine disposal on a natural habitat, observing the effect of surface water runoff on agricultural lands, and observing the behavior of people in regard to energy conservation.

Improving hypothesizing skills

A critical skill in the complex problem-solving process is the ability to state, in a brainstorming creative way, many possible solutions or courses of action that could be examined or tested. If this skill is to be

improved, numerous opportunities for employing it must be planned. One classic activity often used to improve divergent thinking is to have students individually or in small groups list uses for a brick.

One activity that has been extensively used in environmental education programs is sometimes called environmental detective. A visit to an abandoned farm poses such questions as the following: Why was the farm abandoned? What happened to the house (only foundation remains)? What was this partially standing building used for? These questions lead to guesses or hypotheses. As the complexity of such activities is increased over the span of several years, students improve their ability to suggest diverse explanations, courses of action, or hypotheses. Because of these activities, the students tend to retain their confidence that creative, diverse hypothesizing will be encouraged and valued and that improving this skill is important.

Other activities that will improve hypothesizing skills involve trying to determine how an unfamiliar weather instrument works, guessing what will happen to a green plant that is put into total darkness, surmising what would happen to animal life in a stream that receives a discharge of hot water from some manufacturing or energy producing source, and hypothesizing what would happen if a town's population would double in a specified period of time.

Obviously, hypothesizing is only one part of the problem-solving process, but it is a separate and identifiable skill that needs development. The testing of hypotheses is another skill that needs a planned sequence of activities for proper development.

Improving decision-making skills

Making decisions or choices begins at a very early age. Deciding what flavor of ice cream you want, which toy to play with, or what clothes to wear are simple choices. The consequences are minimal. As people become older, decision making becomes more difficult because: (1) there may be numerous alternatives; (2) there may be conflicting information or values to be considered; and (3) there may be a wide range of health, financial, safety, ethical, and/or aesthetic-oriented consequences. Teenage students, for example, face alcohol, career, drug, education, or marriage decisions of great consequence.

Young people and adults knowingly or unknowingly make decisions that will obviously have an impact on the environment in a wide range of ways. A comprehensive energy and resource conservation education program would include many opportunities to improve decision-making skills.

LIFELONG LEARNING SKILLS

The decision to use or not use returnable bottles or to throw away or recycle aluminum cans depends on many factors: initial cost, throwaway costs (solid waste management costs), convenience, ethical considerations, roadside or street aesthetics, and more. As students engage in the study of the antecedents and consequences of decision making, their own decision-making process will improve.

In a similar fashion, studying the decisions others make, helps students understand the complexities involved. The truck farmer, for example, must weigh many factors when deciding how to grow vegetables for market: tilling or not tilling the soil; using chemical pesticides, using biological control, or nothing at all. Labor costs, energy costs, impact on the environment, and the market acceptability of the vegetables must also be considered.

The lifelong learning skill of decision making is a critical component in an energy and resource conservation program.

Improving valuing skills

Students need to understand how values are formed and how personally held values influence their daily lives through the decisions they make. The complete internalization of a value requires a sequence of actions that take place over time. The actions have been variously described. The actions listed below suggest an accepted sequence.

1. choosing freely
2. choosing from alternatives
3. choosing after consideration of the consequences
4. prizing (being happy with one's choice)
5. affirming the choice publicly
6. acting on the choice
7. acting on the choice repeatedly as a pattern of life

Teachers, parents and other significant adults need to help young people understand this sequence of actions that leads to the internalization of a value.

Examining the sometimes obscure information related to a given decision causes a person to take a second look at the decision and consider another alternative. Take, for example, the decision to apply a high nitrogen fertilizer to a home lawn. That decision might have been made because of the importance or value placed on these factors: (1) it looks nice; (2) the neighbors did it; (3) the advertising convinced me; (4) my parents did it. When other information is added, such as (1) high nitrogen fertilizer is expensive; (2) it is made from a nonrenew-

able resource (petro-chemicals); (3) it makes the grass grow faster, requiring more frequent, time-consuming cutting; and (4) most lawn mowers use gasoline, a nonrenewable resource; and (5) the grass dies when moisture is very low, the decision may not be quite as satisfactory as first thought, because new values have come to bear on the decision. This process of investigation, evaluation and priority setting becomes more detailed and more organized as it is applied to many different situations. Each person must learn to decide what value or values should take precedence in making a particular decision.

Improving psychomotor skills

Humans begin learning psychomotor skills at birth. Psychomotor skills range from large muscle movements to finite eye-hand coordination. These movements are progressively learned in the early years. Children turn over, crawl, walk, and jump; they also grasp rattles, cut, paste, and draw. Psychomotor development continues during the school years. Students write, paint, sculpt, play musical instruments, and engage in a variety of physical education activities, games and sports.

Many science-related activities involve psychomotor skills. Learners need instruction, practice and assistance to develop their motor skills to an optimal level. In order for students effectively to use optical devices, such as magnifiers, microscopes, telescopes, and binoculars, a planned progression of activities at the appropriate developmental level should be provided. Many energy and resource conservation activities also require the use of optical devices. These activities can enhance the development of psychomotor skills.

Many kinds of measuring and testing devices require manipulation in order to secure accurate measurements. Wind meters, soil samplers, tree core samplers, sling psychrometers, pollution monitoring devices and many other instruments require the development of psychomotor skills. The development of psychomotor skills is integral to improved content instruction. It should be carefully planned and evaluated to insure quality results.

Improving interpersonal relations skills

Too often teachers feel either imagined or real pressure to "cover" a certain amount of material in a unit or a course. The hurry to complete a prescribed number of content objectives often leaves little time for learners to improve their interpersonal relations skills. Yet, these skills are more likely to be transferable to new learning situations. Learners should have ample time and sensitive leadership

CONCEPTS AND UNDERSTANDINGS

to develop the complex skills of cooperation, negotiation, group goal setting, and group decision making. The skills of tactfully disagreeing, positively supporting, succinctly summarizing, and democratically leading come from a long-term guided effort.

Energy and resource conservation activities offer an excellent medium for the development of interpersonal relations skills. When a group of fifth graders is trying to set a time schedule for a resident outdoor education program or when, in a simulation, a group of role-playing learners is trying to decide the best use of a parcel of land or when a student council is organizing a recycling plan for its school, participants have numerous opportunities to sharpen their interpersonal relations skills.

Components and Outcomes—Concepts and Understandings

Many centuries ago in North America and in other parts of the world, the human impact on local ecosystems was of such small consequence that the ecosystems were able to renew themselves rapidly enough to sustain the population. Now population pressures and an increasing standard of living have accelerated humankind's impact to the point that parts of the world ecosystem are not able to renew themselves fast enough to maintain a habitable environment for humans or specific plant and animal species. In other places the decline in environmental quality makes human habitation much less desirable.

This condition was dramatically brought to the attention of the American public through the conspicuous demonstrations of the late 1960s, the first Earth Day in 1970, and the enactment of several precedent-setting pieces of environmental legislation by the United States Congress. These early environmental activities often were confrontational in nature with accusations flowing back and forth between the "good guys" and the "bad guys." Now, more than fifteen years later, there is an emerging understanding by a growing number of people that environmental issues need to be understood from many points of view, e.g., economic, environmental, human, scientific, and technological. Business persons, economists, environmentalists, government regulators, industrialists, interested individuals, health services personnel, legislators, and scientists are increasingly working together to find reasonable resolutions to environmental issues. It is now clear that it is in everyone's best interest to work cooperatively rather than use scarce human and financial resources in confrontational debate or litigation.

Citizen familiarity with environmental issues has been a goal of environmental education since the environmental decade began in

CONCEPTS AND UNDERSTANDINGS

1970. A great deal of time and money has been spent on this task, and progress has been made. Much more needs to be done. Educators have a large responsibility in this effort.

The focus of attention of world citizens has been shifting from crisis to crisis as newly discovered insults to our environment have been dramatically portrayed by the media. Each incident brings awareness, outrage, research, debate, resolution, and finally action. Overreaction has also occurred. Now businesses, citizens, governments, and industries participate in the process of finding solutions. The future will surely bring new environmental problems. Here are a few of the most recognized environmental issues of recent years:

- oil spills on land and sea
- inappropriate disposal of hazardous wastes
- particulate and chemical air pollution
- radiation from space and nuclear materials
- chemical contamination of food and water supplies
- human population change
- endangered animal and plant species
- resource depletion
- health hazards in the home and workplace
- aesthetic degradation
- loss of prime agricultural land

These and other complex issues can be categorized in countless ways. The one chosen for this publication utilizes seven categories which broadly cover those areas of greatest importance: energy, food and fiber, population, land use, goods and services, environmental quality, and resource use. While these categories can be studied and discussed individually, they remain highly interrelated.

The ideal way to learn about environmental issues is in an interdisciplinary curricular organization. In such an organization, aesthetic, economic, ethical, governmental, mathematical, political, scientific, sociological, and technological aspects of these complex issues can be addressed in a holistic way. Moving toward interdisciplinary education, therefore, is strongly encouraged.

In reality the departmentalization of elementary and secondary education may require that these environmental issues be integrated into the disciplinary curriculum. Each curriculum development committee will need to decide how to fit this important part of education into the particular curricular framework and time schedule of its school district.

A brief description of the seven categories of environmental issues follows. Subject objectives, curricular resources, and a list of references will be found in other sections of this publication.

CONCEPTS AND UNDERSTANDINGS

- ***Energy***

The double impact of the availability and cost of energy profoundly affects every world inhabitant now, and it will continue to do so in the future. No single basic need, save food and water, is so critical to a person's well being. It is essential, therefore, that students participate in a planned program of energy education so that they have a thorough understanding of the history, supply, sources, production, distribution, and use of the many forms of energy. Critical, too, is a broad understanding of the economics of supplying the world's people with adequate energy and the environmental impacts associated with its use. As in other areas of our society, rapid technological development in the supply and use of all forms of energy requires continual updating of energy education.

The Arab oil embargo gave a great impetus not only to energy education but also to energy conservation. These education and conservation efforts, along with associated economic considerations, have dramatically changed the way energy is used. A national speed limit, smaller cars, weatherization of homes, increased attention to building insulation, lowered thermostats, earth bermed homes and offices, electrically-ignited gas appliances, increased use of renewable resources, and dozens of other innovations have become an accepted part of life for Americans.

As nonrenewable energy resources are depleted and as energy demand increases, citizens will be required to make numerous decisions that affect their daily lives. A comprehensive K-12 energy education program will prepare them for that decision making and will help them cope effectively with the changes that occur.

- ***Food and Fiber***

Producing, processing, distributing, and consuming food and fiber from farms, fisheries, forests, and ranches have diverse impacts on the environment. Additionally, these activities have economic and lifestyle implications for Americans and other world inhabitants. The food and fiber industries, therefore, are a fertile area for study and are closely related to the other areas of energy, population, land use, and environmental quality. Many authors have emphasized the idea of interrelatedness by repeatedly stating that everything is connected to everything else.

- Food and fiber production includes
  - energy use
  - land use
  - soil and water conservation practices
  - forest and range management
  - fertilizer use
  - pesticide and herbicide use
  - irrigation and climate

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- Food and fiber processing includes
  - waste water processing
  - product additives
  - energy use
  - solid waste disposal
  - air pollution
  - packaging
- Food and fiber distribution includes
  - trucks and highways
  - trains and roadbeds
  - ships and waterways
  - energy use
  - air, land, water pollution regulation, and politics
  - economics of distribution
  - spoilage, preservation, storage
  - undernourishment, starvation
- Food and fiber consumption includes
  - package disposal
  - energy use
  - nutrition
  - health

The inclusion of educational activities in the area of food and fiber production is a relevant and important part of a K-12 comprehensive energy and resource conservation program. Any of these topics can be effectively used to develop the lifelong learning skills that are so important in coping with the complexities of twentieth and twenty-first century living.

- ***Population***

The increase and decrease of human populations on the earth has been researched by demographers and widely reported. During and since the environmental decade of the 1970s, the research and reporting of population change has dramatically increased. This has affected public policy in foreign affairs and domestic affairs. Immigration, emigration, population control, birth and death rates, fertility rates, starvation, and many more concerns have been widely discussed and reported. The concept of zero population growth has been widely misunderstood. The legal and illegal immigration into the United States has become a major political issue because of its relationship to unemployment, voting, welfare, poverty, bilingual education, and other concerns.

CONCEPTS AND UNDERSTANDINGS

Citizens of the twenty-first century need to be familiar with all of these issues in order to make intelligent decisions on both the personal level and as members of the national and world communities. Once again the lifelong learning skills should be the focus of all population learning activities.

- ***Land Use***

Strip development, urban/suburban sprawl, destruction of natural habitat, soil erosion, highest and best use, loss of prime farm land, management of government lands, mineral extraction, and many more issues have direct relationships with the present and future lives of students. City, township, county, and state zoning rules and regulations impinge directly on students and their families.

For example, at the present time 10,000 acres of farm land in the United States are shifted to uses other than agriculture every day. With our present surplus of farm commodities that may not seem like a very important piece of information, but we must plan now to ensure that we will always have enough food-producing land to meet domestic and export needs. The common biological concept of carrying capacity is a critical understanding for students in relation to this problem.

The investigation of these environmental concerns by students brings them in touch with real problems and helps them develop lifelong learning skills such as decision-making skills and research skills. Further, it develops the value that people need to be involved as participating citizens in decisions that affect their lives.

- ***Goods and Services***

The gross national product is a measure of all the goods and services produced. All of this activity requires the use of natural resources and energy. Goods and services production sometimes generates hazardous byproducts, some of which have a negative impact on the environment. Students need to understand the positive and negative aspects of this production and determine if their lifestyle decisions (consumptive patterns) are consistent with their knowledge and values.

America's tendency to produce material goods that have a planned obsolescence and it's propensity for making convenient throwaway containers have led many people to call ours a throwaway society. This present condition is in direct conflict with the efforts many people make, to develop in themselves and others a positive environmental ethic. A comprehensive energy and resource conservation education program would include learning activities that would cause daily decision making to be more consistent with current environmental and scientific information.

CONCEPTS AND UNDERSTANDINGS

- *Environmental Quality*

The American people have shown by actions and by answering survey questions that they are overwhelmingly in favor of an environment that is aesthetically pleasing and healthful. To this end they have supported legislation, changed their habits and contributed time and money to a wide variety of environmental causes. Progress has been made, and this momentum needs to be maintained.

When students are involved in learning activities that enhance their understanding of relationships between their own decisions and how these decisions affect their environment, they are practicing skills that they will use all their lives. They need to have first-hand involvement in the resolution of environmental issues that include economic, scientific, technological, ethical, and political dimensions. This involvement will lead to the development of attitudes and skills that will make it possible to fashion tradeoffs and compromises that are needed to resolve often conflicting economic, political, and environmental considerations. The primary objective of the learning activities, therefore, will be the development of lifelong learning skills that will enable a person to deal effectively with both current and future, yet unknown, issues.

- *Resource Use*

The use of resources by humans is not a recent activity. However, as the world population increases and the standard of living increases, resource use accelerates with an increasing impact on the environment. Much of this increased environmental impact is detrimental to human, animal, and plant health and to people's enjoyment of aesthetic experiences. All parties involved and affected by this accelerating resource use need to cooperate in eliminating or reducing the potential negative impact on the environment. The term "wise use" has been widely used in this regard.

Extracting, gathering, processing, transporting, and using resources can have many diverse impacts on the environment. Students need to know how resources are used and what issues are involved in making that use compatible with the environment and yet economically and technologically feasible.

For students to understand fully how resource use affects the environment, they must at the same time learn about the natural environment and how it functions. Excellent nature study, natural science, natural history, and outdoor education activities have been included in school curricula for years. These efforts must be expanded and related not only to resource use but to all seven of the energy and resource conservation components described above.

ETHICAL BEHAVIOR

Components and Outcomes—Ethical Behavior

All people develop a code of conduct or ethical behavior as they live their lives. It usually develops slowly, almost unnoticed, and is shaped by many experiences. Often people suddenly become aware of a particular behavior and then wonder what forces shaped their code of conduct that produced that behavior. A period of introspection may then occur resulting in an altered code of conduct.

An effective energy and resource conservation education program should assist students in understanding how attitudes are formed, how values are developed, and how ethical behaviors are manifested. The program can include discussions and exercises designed to guide students in introspective thinking about their value system and how it influences their decisions and conduct.

Institutions that influence values include the family, school, peer group, church, and the media (e.g., entertainment, and advertising). The discussions should identify attitudes and values that are encouraged by each of these institutions and the manner in which they influence future decisions the students will make. Students should be encouraged to realize that their anticipated vocation, family size, socioeconomic status, and associated resource consumption all have an environmental impact. Thus, life goals must be evaluated over and against the value each individual places on environmental conservation. Once students have gained awareness of the importance of value systems and the manner in which society shapes values, specific conservation issues can be introduced.

Knowledge is certainly an important part of this process. For example, knowing that the energy used to make one aluminum can from original material can make twenty-two aluminum cans if recycled aluminum is used may cause a person to take the time to recycle all aluminum cans and even encourage others to do the same.

Additional incentives for ethical behavior may come from adult models, whether the adults have internalized the environmental ethic or are motivated by external factors (e.g., they recycle goods because of a good price or a convenient recycling process). Just as ethical behavior in adults may exist for nonethical reasons, young students may develop an environmental ethic because of external factors. Role models for adolescents tend to be their peers or persons with fame or notoriety. The role model concept, therefore, cannot be the only basis for promoting the environmental ethic. The student who internalizes the environmental ethic during the formative years has great potential for continuing to practice ethical behavior during the teen years and as an adult.

ETHICAL BEHAVIOR

Another activity that may contribute to changed ethical behavior is first-hand experience. Testing soil for pollutants could have a dramatic impact on the behavior of students. For example, if lead is found in the soil near a highway, the student may stop fueling the old car with leaded gasoline and switch to unleaded gasoline, even if it is more expensive.

Students who receive help in understanding the consequences of their behavior (decisions) will often alter their ethical behavior. For example, if students are helped to understand that discarding food after a meal means that all the energy needed to grow, process, transport, and cook that food has been wasted and probably has contributed to higher energy costs, then it is likely that they will discard less food. When resources are scarce or are becoming scarce, giving those resources a price which reflects their replacement cost and their value to future generations helps individuals to realize that their behavior has consequences in the environmental arena. Thus, knowing the complex interrelatedness of many human actions and the consequences of those actions often results in a changed ethical behavior.

Students who face the consequences of littering can understand the consequences of contributing to that litter. Counting the mosquito larvae on the surface of water which has accumulated in abandoned tires could have an impact on attitudes about the location of junkyards. Ecology practiced in the chemistry laboratory can enhance the internalization of the environmental ethic. Students can see the advantage of recycling copper sulfate if the experiment yields plated coins or keys. Recycling the same reagents for years helps the student practice a valuable process. The conservation ethic can be learned by students who see that chemical tests can be made by using micro-sized test tubes and small amounts of solution. Students who see the before and after of conservation efforts can compute the advantages of such practices as using solar energy as an alternative source of heat, and scheduling heat-requiring experiments for sunny days of the year. Rewarding students for their work in making energy-saving equipment for the laboratory will illustrate the cumulative effect of cooperative efforts.

An environmental ethic is many faceted and highly complex. It should not be a list of *do's* and *don't's* but rather a list of realities and relationships that bear directly on a person's quality of life. A few such realities and relationships are

- People are full partners in the world's ecosystem.
- People's activities can be helpful or detrimental to the world's ecosystem or to one or more of its many diverse biotic communities.

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- The destruction or alteration of one component of an ecosystem usually has a profound effect on all other components of that ecosystem.
- Science and technology often can find solutions to an environmental problem; but that may not always be the case and so we must be cautious.
- Even when science and technology can provide a solution to an environmental problem, a society may choose not to apply it because of economic, political, or moral restraints.

Other realities and relationships could be stated. The five above will give a school district committee on energy and resource conservation a starting point.

Aldo Leopold in *A Sand County Almanac* states that decisions concerning the environment need to be based more on ethical considerations and less on economic ones.

> Questions must be examined in terms of whether it is ethically and aesthetically right, as well as what is economically expedient. A thing is right when it preserves the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.

The balance between economic considerations and ethical ones is a key idea that students need to explore and understand.

In order for a student to be able to think environmentally and to internalize the environmental ethic, the experience of discussing issues, dilemmas, and alternatives is necessary. Matthew Lipman of the Institute for the Advancement of Philosophy for Children promotes discussion as the key strategy to the development of a philosophy. Discussion gives the student an opportunity to discover the scope of the problem, to contribute facts and opinions, to hear counter examples and opinions, to cooperate in building on his own and other students' ideas, to question assumptions, to suggest alternatives, and to listen to the ways people express their views.

Many other authors have commented on the special need for all citizens of the world to internalize an environmental ethic. Most of the people mentioned on page 6 made such statements. Additional information on many of them can be found in Appendix A, page 51.

COURSE OF STUDY

CHAPTER II

ENERGY AND RESOURCE CONSERVATION IN THE COURSE OF STUDY

Requirement

The minimum standards for Ohio's elementary and secondary schools require school districts to "provide for the following topics to be a part of the curriculum...energy and resource conservation education...." Excellent programs in energy and resource conservation have been a significant part of the educational program in many Ohio schools. This publication will make it possible for school district personnel to review current programs to see if the requirement is met and then to plan for changes in their courses of study to provide students with expanded and improved programs.

Curricular Structure

The requirement can be met in at least four different ways. Choose one or formulate your own and move ahead.

- *Option #1*
  Select programs and subject objectives in present courses of study that are considered to be appropriate for energy and resource conservation education and code or identify them.
- *Option #2*
  Select and identify program and subject objectives in present courses of study that are considered to be appropriate for energy and resource conservation education and then determine if additional objectives need to be added to bring the K-12 program to an appropriate level of excellence. Any new objectives would then be added to existing courses of study.
- *Option #3*
  Write a separate K-12 course of study for energy and resource conservation education. This course of study would contain K-12 program and subject objectives that would provide a comprehensive and integrated program of activities in the following: (1) lifelong learning skills; (2) human activity and concerns related to the environment; and (3) the internalization of an environmental ethic.
- *Option #4*
  Write a separate K-12 course of study with an interdisciplinary curriculum structure making it possible for the program and subject objectives to reflect a holistic approach compatible with the student's real world point of view.

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Course of Study Development

The development of courses of study has been going on for many years. Recently, an Ohio Department of Education publication, *Course of Study: A Process Model*, has been available to assist in this process. The suggestions made here are consistent with that publication.

The course of study development process may be complex and time consuming. Committees are encouraged to allow plenty of time and to plan carefully so that the course of study will be easily understood by the teachers who use it.

One of the critical tasks in the course of study development process is the sequential development of ideas that flow logically from the school district philosophy to the program philosophy to the program goals to the subject objectives. In the following sections there are examples from Ohio school district courses of study which illustrate the thread of energy and resource conservation that is essential.

These examples will be followed by synthesized K-12 course of study components that illustrate how a comprehensive energy and resource conservation course of study is developed.

Excerpts from School District Philosophies

- "Develop knowledge and understanding of the natural environment" (Franklin Local)
- "...students need the opportunity to explore...the physical characteristics and foundations of nature..." (Southwest Licking Local)
- "...to provide each student with the necessary skills to look at all sides of an issue...and to make adequate decisions." (North Fork Local)
- "...students must have freedom to move, to investigate, to try out other ideas..." (Licking Valley Local)
- "...students need to be knowledgeable about their community, its resources and the world in which they live." (Cleveland City)

These excerpts demonstrate that lifelong learning skills and familiarity with environmental issues have already been considered an important part of an educational program. With this foundation it can be expected that various program philosophies would express similar ideas.

Excerpts from Program Philosophies

- "...promotes an attitude of inquiry which includes questioning, exploring, experimenting, observing, measuring, manipulating, concluding and communicating." (New Richmond Exempted Village)

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- "...heighten...curiosity in and appreciation of all things in the universe touching the past, present and future of man." (Toledo City)
- "...will also be multifaceted with the use of the natural environmental and community resources as well as current issues...in providing the students with a basic knowledge for future societal development." (Madison Local)
- "...the student should make a commitment to self-improvement through lifelong learning." (Westlake City)
- "...deals with human beings' relationship with their social and physical environment...concerned with the development of those skills, values and attitudes that enable the individual to be a responsible member of a democratic society." (Hamilton City)

These program philosophy excerpts emphasize the critical need to help students develop lifelong learning skills and a familiarity with their many diverse environments so that they may live in harmony with their world, participate fully in their society, and lead full lives. A K-12 energy and resource conservation program should substantially contribute to this goal.

Excerpts from Program Goals

- "To develop intellectual growth, stimulate original thinking, develop inquiry techniques, develop problem-solving techniques, and develop an appreciation and understanding of the man-made and natural environments." (Huron City)
- "To develop an appreciation for the world in which we live." (Granville Exempted Village)
- "To help the student develop an awareness of and an inquiring interest in our world, to appreciate beauty and orderliness of our complex world." (Clyde-Green Springs Exempted Village)

These program goals emphasize the interrelatedness and complexity of the human-environment relationship and the special importance of well-developed thinking skills that are required for living responsibly now and in the future.

Excerpts from Program Objectives

- "Know that the laws of science...can be applied to solve problems relating to...conservation of natural resources, pollution, food supply, population control and the dangers of radiation." (Mahoning County Schools)
- "To develop the student's understanding of scientific interactions in the environment." (Green County Schools)

- "Students will develop an appreciation and awareness of the environment and of mankind's responsibility for its proper use." (Wyoming City)
- "Grow in appreciation for the interrelationships and interdependence among all living and nonliving things." (Buckeye Valley Local)
- "Environmental education should emphasize the need to avoid misuse of natural resources and preserve the natural quality of life, but there should be balanced recognition of mankind's need of natural resources, energy, food, goods and services." (Milton-Union Exempted Village)

School districts have obviously recognized the need for providing students with high quality energy and resource conservation education. Although most of these program objectives appear in science courses of study documents, they also may often be found in social studies and in other disciplines.

Excerpts from Subject Objectives

- "construct and describe food chains and food webs." (Graham Local)
- "use knowledge of technology as it relates to environmental problems." (Dayton City)
- "recognize that air pollution and water pollution are harmful to living things." (Canton City)
- "list some effects of the continued growth in population." (Port Clinton City)
- "know the uses of coal, oil, and natural gas." (Painesville City)
- "know the causes and effects of noise pollution." (Painesville City)
- "develop the ability to make decisions relating to... quality of life." (Painesville City)
- "identify ways to conserve energy." (Springfield City)
- "draw conclusions from data collected." (Triad Local)
- "develop an understanding of renewable resources and how they are used." (Jefferson Township Local)
- "describe or illustrate the use of wind power as an energy source to produce electricity." (Springfield City)

Subject objectives address diverse topics and have a broad range of specificity. Although most of the above samples are topically oriented, bear in mind that the lifelong learning skills and the ethical and value oriented objectives constitute the critical thrust of energy and resource conservation. Sample objectives in those areas will be found in the next section.

COURSE OF STUDY

Model Course of Study

The preceding excerpts indicate clearly that Ohio school districts have included some energy and resource conservation education in their courses of study. Most districts, however, have not chosen to construct a comprehensive articulated K-12 program which includes all the components that have been enumerated in the preceding pages. Since such a comprehensive program is in the best interest of Ohio students, sample course of study components for energy and resource conservation have been synthesized as a guide for K-12 school district committees that have been given that course of study development responsibility. It should be kept in mind that such a course of study is not required, but is one of several options explained on page 22.

Here, then, are the components that should be helpful in constructing a locally appropriate course of study in energy and resource conservation education. The following material is not intended to be polished and complete but rather is intended to suggest phrasing that might be incorporated into school district courses of study.

School district philosophy (illustrative)

It is the intention of the Central School District (fictional) to provide its students an educational program that assists them in effectively dealing with the many facets of their lives and gives them ample opportunity to learn the skills and abilities they will need to be fully functioning world citizens the balance of their lives. The curriculum, therefore, will include a component that will emphasize lifelong learning skills such as coping skills, critical-thinking skills, problem-solving skills, and communication skills. Included in this component would be appropriate opportunities to make creative contributions, develop aesthetic appreciations and build a values framework.

The curriculum would also include opportunities for students to explore and prepare for their first career and/or to prepare for post-secondary education. A wide variety of opportunities for students to explore extracurricular or leisure time interests will be provided.

All of this activity will take place in an atmosphere of mutual trust and with an emphasis on participatory democratic procedures. The community, the parents, the students and the educators will participate in the governance of the school programs, thus, showing by example how a democratic society functions.

Energy and resource conservation education program philosophy (illustrative)

The Central School District (fictional) believes that it is essential for students to develop lifelong learning skills that will enable them to

make individual and group decisions that are compatible with a sustainable environment. A rational decision-making process must be based on the ability to consider a decision from economic, political, moral, technological, societal, and personal viewpoints. Thus, a comprehensive energy and resource conservation education program must include real-life hands-on experiences.

Curricular activities will concentrate on the lifelong learning skills as the primary objectives. The environmental topics which are to be the vehicle for skills development should be chosen so that students have a balanced exposure to the seven areas of energy, food and fiber production, population, land use, goods and services production, environmental quality, and resource use. A planned program of career awareness in the environmental field will be offered. The internalization of an environmental ethic should be a natural yet planned outcome of this K-12 program.

Energy and resource conservation program goals (illustrative)

- The student will acquire an aesthetic appreciation of the natural and built environments that exist locally, nationally and globally. (affective)
- The student will develop a life style that is based on a rational values framework and an examined ethical understanding. (affective)
- The student will improve the ability to use effectively and safely, tools, equipment, and materials that are associated with environmental and energy investigations. (psychomotor)
- The student will acquire increased ability to use the five senses to improve the perception of energy and resource conservation issues. (psychomotor)
- The student will develop and/or improve lifelong learning skills needed to live purposefully in an increasingly scientific and technological world where human activity impacts both positively and negatively on the natural and built environments. (cognitive)
- The student will use communication analysis skills to evaluate written, verbal, and visual materials for the purpose of determining their validity and reliability. (cognitive)
- The student will retain for future use information, concepts, relationships, theories, and opinions that will be pertinent to future decisions that will be required. (cognitive)
- The student will understand the complexity and interrelatedness of environmental issues included in the seven aforementioned categories. (cognitive)
- The student will understand the many career opportunities that are associated with energy and resource conservation. (cognitive)

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Program goals are developed directly from the program philosophy statement. They are more detailed and are often designated as affective, psychomotor, or cognitive. School district course of study committees will determine the number of goals required to address all of the components of a comprehensive energy and resource conservation program. Writing only three or four goal statements usually results in an unclear description of the intent of the program. Writing more than ten or twelve may give an impression that the task is too difficult to manage. The nine given here should promote discussion and illustrate one way to emphasize the various components of a comprehensive program.

Energy and resource conservation program and subject objectives (illustrative)

School districts are not required to write program objectives and submit them for approval. Subject objectives are required. In the following illustrative examples, however, both program and subject objectives are included to show how program goals are delineated into more precise statements of what learners are expected to accomplish. An appropriate notation system should be developed to indicate at what grade level(s) or in what courses a particular subject objective is to be addressed. The three examples are for goals four, five, and seven. The way each goal was divided into more specific statements is not the only way. The format, too, is only one of many that could be selected. The program goal is restated for your convenience. Depending on which of the four options has been selected, subject objectives, such as these examples, may appear in existing courses of study or may be part of a separate K-12 energy and resource conservation course of study.

COURSE OF STUDY

- *Example 1*

Program Goal 4 The student will acquire increased ability to use the five senses to improve the perception of energy and resource conservation issues. (psychomotor)

Program Objectives	Subject Objectives
4-1 The student will develop more receptivity to environmental stimuli.	4-1-1 (K-3) The student will develop more awareness of the natural, altered, and built environments through the more discriminating use of the five senses.
	4-1-2 (4-8) The student will develop more accurate impressions of the natural, altered, and built environments by using sensory enhancement devices such as magnifiers, binoculars, telescopes, amplifiers, thermometers, wind meters, noise meters.
	4-1-3 (9-12) The student will be able to use sensory enhancing devices and equipment effectively in environmental investigations or experiments.
4-2 The student will develop the ability to take appropriate actions based on sensory impressions of environmental happenings.	4-2-1 (K-3) The student will take action based on environmental stimuli, e.g., turn off lights when not being used, pick up litter, recycle cans, take shorter showers.
	4-2-2 (4-6) The student will take action based on environmental stimuli, e.g., participate in actions to stop playground erosion, speak up for reduced use of chemicals on neighborhood lawns, contact government agencies about poor environmental conditions.
	4-2-3 (7-8) The student will alter daily decisions based on sensory impressions of resource use, e.g., use less energy after seeing a strip mine operation, stop throwing junk in stream after canoeing in one.
	4-2-4 (9-12) The student will voluntarily take individual actions or help with group actions on a local, state, national, or global level based on sensory-based environmental data gathering.

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- *Example 2*

Program Goal 5 The student will develop and/or improve lifelong learning skills needed for living purposefully in an increasingly scientific and technological world where human activity impacts both positively and negatively on the natural and built environments. (cognitive)

Program Objectives	Subject Objectives	
5-1 The student will use thinking and problem-solving skills with energy and resource conservation issues.	5-1-1	(4-6) The student will identify fact and opinion statements in an environmental article.
	5-1-2	(7-8) The student will identify the bias of the author of an article on a controversial environmental topic.
	5-1-3	(7-8) Given an environmental problem, students will generate alternative solutions to the problem.
	5-1-4	(9-12) Given evidence concerning an environmental issue from diverse points of view, students will evaluate the quality of the evidence and the bias of the presenter, and will weigh the possible consequences of a given course of action.
5-2 The student will use valuing and individual and group decision-making skills when participating in energy and resource conservation activities.	5-2-1	(5-6) Students will participate in energy and resource conservation projects that will lead to group decision-making skills (clarifying, analyzing, summarizing, compromising, etc.)
	5-2-2	(7-8) Students will understand how tradition, family, peers, and knowledge promote the development of values that relate to energy and resource conservation.
	5-2-3	(9-12) The student will be able to examine critically the various sources which influence the development of attitudes toward environmental issues.
5-3 The student will use mathematical skills when working with energy and resource conservation data.	5-3-1	(4-6) The student will interpret circle, bar, and line graphs which present environmental data.
	5-3-2	(7-8) The student will compute the energy efficiency ratings of various brands of appliances.
	5-3-3	(9-12) The student will collect quantitative data from energy or environmental experiments or activities and calculate, manipulate, and translate the data for clear concise presentations.

5-4 The student will learn to use communication and human relations skills when dealing with energy and resource conservation issues.

5-4-1 (K-3) The student will be able to describe a problem illustrated by an environmental picture or drawing.

5-4-2 (K-3) The student will recognize an enjoyable outdoor experience for self and others.

5-4-3 (4-6) The student will recognize the many facets of an environmental issue.

5-4-4 (4-6) The student will recognize the value of a resident outdoor education program that emphasizes cooperation and group decision making.

5-4-5 (4-6) The student will summarize activities experienced at a resident outdoor education program.

5-4-6 (4-6) The student will learn to describe his/her environment by continually developing all five senses.

5-4-7 (7-8) The student will develop interview techniques to ascertain how energy usage has changed over the lifetime of the interviewee.

5-4-8 (9-12) The student will be able to participate actively in a small group environmental activity, experiment, or project that requires substantial and learner-appropriate communication and human relations skills.

COURSE OF STUDY

- *Example 3*

Program Goal 7 The student will retain for future use facts, information, concepts, relationships, theories, and opinions that will be pertinent to current and future decisions.

Program Objectives	Subject Objectives
7-1 The student will understand the primary sources of energy and their conversion, distribution, and use.	7-1-1 (K-3) The student will recognize the difference between renewable and nonrenewable sources of energy.
	7-1-2 (K-3) The student will know the types of energy used at home and school.
	7-1-3 (K-3) The student will recognize the various ways energy is distributed to homes, e.g., wires, trucks, pipes.
	7-1-4 (K-3) The student will know how to use energy safely, e.g., electricity, natural gas, gasoline, kerosene.
	7-1-5 (4-6) The student will know how one form of energy may be converted to another.
	7-1-6 (4-6) The student will understand how steam is used to produce electricity.
	7-1-7 (4-6) The student will understand the importance of the safe transportation and storage of various forms of energy.
	7-1-8 (7-8) The student will be able to recognize when a renewable energy source can be substituted for a nonrenewable energy source.
	7-1-9 (7-8) The student will understand the historical development of energy production.
	7-1-10 (7-8) The student will understand the role of energy in the production of food.
	7-1-11 (9-12) The student will understand the national and global political realities that influence the discovery, production, distribution, and use of energy.

7-2 The student will understand the economic, social, and environmental impact of securing, transporting, converting, and distributing the various forms of energy.	7-2-1	(K-3) The student will understand that dam construction will create a new habitat that will attract different animals.
	7-2-2	(K-3) The student will recognize that an oil spill will endanger fish and water fowl.
	7-2-3	(4-6) The student will be able to compare the impact on the environment of deep mining and strip mining.
	7-2-4	(4-6) The student will be able to discuss the potential environmental impact of oil wells drilled on land and under water.
	7-2-5	(9-12) The student will understand the economics of energy discovery, production, distribution, and use.

The grade groupings used in the above examples are illustrative. Other groupings may be more appropriate for your school system. Another format often used is to construct a matrix with the horizontal axis indicating grade levels and the vertical axis listing the subject objectives. A code system indicates the level at which the objective is introduced (I), the level(s) at which the objective is developed (D), and the level at which it should be mastered (M).

A critical need in the development of a course of study is to construct it so that an idea is expressed clearly in the school district philosophy, is repeated and expanded in the program philosophy, becomes more specific in the program goal statements, and is further detailed in the program objectives and/or subject objectives.

A well-designed course of study supplemented with a detailed curriculum guide will ensure a comprehensive energy and resource conservation education program that meets the needs of all students.

CHOOSING ACTIVITIES

CHAPTER III

CHOOSING ENERGY AND RESOURCE CONSERVATION ACTIVITIES

Members of school district course of study committees and classroom teachers have access to a great array of sources of learning activities for energy and resource conservation education. For many years school districts, state and national environmental organizations, commercial publishers, corporations, governmental agencies, and quasigovernmental agencies have been producing collections of energy and resource conservation activities. The quality ranges all the way from excellent to poor. The focus of the activities ranges from simple fact acquisition to interdisciplinary, learner-involving, process-oriented skill development. The quantity is almost limitless.

This availability and diversity make it possible to assemble an excellent K-12 sequence of activities that will be consistent with the school district philosophy of energy and resource conservation education. It is not the purpose of this publication to provide a list of the specific K-12 activities that would be needed to implement a complete course of study. It is strongly recommended, however, that activities be carefully chosen so as to maintain a balance among the areas of lifelong learning skills, the seven topical categories, and the ethical issues.

New energy and resource conservation activities are being developed and published regularly in all the areas that have been mentioned. Many excellent activities have been published over the years and are still available. These fine activities may be found in publications under various headings: science education, environmental education, outdoor education, conservation education, ecology, nature education, and others.

A few of the many sources for energy and resource conservation activities are listed in Appendix B beginning on page 62. Help in finding additional sources may be available from the organizations listed in Chapter VI beginning on page 43.

TEACHING STRATEGIES

CHAPTER IV

TEACHING STRATEGIES

Most of the teaching strategies that teachers will use in energy and resource conservation activities are not new. Whole class instruction, individual reports, read and discuss, and others are as appropriate as they are in other areas of learning. But, because of the complexity and interrelatedness of the goals of a K-12 energy and resource conservation education program, some less-used teaching strategies will be described in this chapter.

As the course of study committee members develop program goals and subject objectives, they should consider, at the same time, the learning activities and teaching strategies that will be required to accomplish those goals and objectives. This instructional planning will focus on the three interrelated components mentioned earlier: (1) lifelong learning skills; (2) human activity and its impact on the environment; and (3) internalization of an environmental ethic.

The following list of teaching strategies may not be complete nor is the list arranged in some order of importance or desirability. It should be considered a place to begin. Curriculum planners should build a comprehensive and effective program by choosing a variety of appropriate strategies from this and other sources.

- Individual and group **projects** often require the learner or learners to combine informational research (cognitive), manipulative or construction activity (psychomotor), and feelings and opinion examination (affective) as they work to complete the project. Such projects may be as simple as building a solar hot dog cooker or as complex as building a working model of a watershed.
- By planning procedures, collecting responses, tabulating responses, analyzing responses, and presenting results for oral or written opinion or information **surveys,** learners can learn communication skills while improving their awareness of the values and beliefs held by peers, parents, or community members on given environmental issues. Such surveys could be used in conjunction with planned school energy conservation practices or as evidence at a legislative or regulatory hearing.
- Teachers effectively use **interest centers** as a regular activity in the classroom. These are usually short-time activities and may include puzzles, games, matching exercises, manipulative tasks, ordering, skill development, and others. More and more computer software packages are becoming available to provide teachers with additional interest center activities.

TEACHING STRATEGIES

- An effective energy and resource conservation program includes activities that explore the causes and effects of **decision making.** Often students make decisions or express opinions, and they are not even aware of what lies behind or what caused those decisions to be made or opinions to be expressed. Students need to become aware of how values are formed and how they are changed. Trying to rank the "most necessary" uses of energy in their lives or examining the pros and cons of strip mine reclamation are but two appropriate activities.
- A recent emphasis in the improvement of education has been the effort to make connections between school subjects and the real world. Perhaps, therefore, it is appropriate to include here the strategy of **application.** Simply stated, this strategy involves arranging for students to apply theories, laws, facts, and concepts to everyday environmental problems or for students to observe how critical environmental problems are solved by scientific discoveries which are then translated into technological solutions.
- **Participation** in the real life activities of decision making, regulation adopting, lobbying, persuading, and law making is an effective strategy. An example of this strategy would be for a group of learners (classroom or school or larger group) to conduct a campaign of letter writing, media events, parades, and demonstrations to convince legislators that a particular bird, plant, animal, or fossil should be designated as the "official" one for a city, state, or nation.
- When direct participation is impractical, a teacher may choose the well-known strategy of **simulation.** A city council meeting or a legislative hearing could be simulated in the classroom by having students assume the roles of the various people who are usually involved in such a process.
- With careful guidance students can learn a great deal by conducting **investigative reporting** on a given energy or resource conservation issue. Students can ask questions and locate information on the siting of a land fill, the circumstances of a toxic substance spill, or the accidental release of a pollutant into the air or a water course.
- Teachers can expand their use of **experimentation** by helping learners plan experiments that precisely state the problem, carefully control or purposely change variables, record data, and analyze results. Determining soil erosion from plots covered with different types of vegetation, calculating heat transfer through different materials, and determining plant and animal populations in controlled habitats are all excellent experiments for learners.

TEACHING STRATEGIES

- Careful, planned **observation** of environmental phenomena will spark enthusiasm for learning about the environment. Storm watches, animal behavior, metamorphosis of insects, mineral extraction, and plant growth, are all effective learning activities.
- Several of the above strategies are often combined in another teaching strategy that is familiar to everyone—the **field trip.** Field trips are particularly important for a quality environmental education program. The impact of human activity on natural and built environments can best be understood when first-hand observation and/or participation is the mode of learning. Since the array of field trip possibilities is so vast, a four-way categorization may be helpful.

  I. collections for easy access—museums, arboreta, aquaria, botanical gardens, zoos, archives
  II. human activity—industry, transportation, farms, fire stations, sewage plants, utilities, fisheries
  III. historical sites—battlefields, invention sites, cemeteries, architectural sites, archeological digs
  IV. natural environment—lakes, streams, forests, prairies, deserts, swamps, hills, marshes.

- A variation of the field trip that utilizes the school site is referred to as a **school land laboratory.** Whether the school is urban, suburban, or rural, usually there are resources usable for environmental education activities. Some schools are fortunate to have natural features such as a stream, drainage ditch, woods, pond, prairie, or swamp. Often extra lawn areas can be transformed into succession plots, an arboretum, wildlife plantings, garden plots, and other learning stations. These areas are ideal for hundreds of activities appropriate for different grade levels. Appendix B, page 62 and Appendix C, page 67 give sources for hundreds of activities. Even a very small, mostly paved site is usable for stimulating and interesting activities. Activities conducted in a school land laboratory require varied teaching strategies.
- Another teaching strategy which is seldom mentioned in textbooks has been used in Ohio for more than 30 years. It could be called an **extended field trip,** but the term used in connection with environmental education is **resident outdoor education.** As many Ohio educators know, this strategy is an energy and resource conservation activity which requires the transportation of students from their school to a facility where meals and lodging are provided for two to five days. Program activities are wide ranging. Often the natural sciences are the focus of such

programs, but environmental issues of all kinds are regularly included. The advantages presented by such a strategy are as follows: (1) opportunities for cooperative learning; (2) participation in research projects; (3) opportunity to build quality interpersonal relationships among learners and leaders; (4) growth of aesthetic awareness; (5) opportunity to develop an environmental ethic; and (6) development of thinking and psychomotor skills.

Here are some other teaching strategies that could be incorporated into an energy and natural resource conservation program: (1) brainstorming; (2) demonstration; (3) debate; (4) audiovisual presentation; (5) interviewing; (6) problem solving; and (7) case study.

K-12 energy and resource conservation education activities require widely varying teaching strategies. Variety helps keep the interest and enthusiasm for learning high. As teachers become proficient in using the less common strategies, the program will steadily improve.

PLANNING INSERVICE

CHAPTER V

GUIDE TO INSERVICE ACTIVITIES

Planning Inservice Programs

Some Ohio elementary and secondary teachers have earned graduate degrees that focused on energy and resource conservation education. Many others have taken undergraduate or graduate courses in this field, while others have attended numerous outdoor education or environmental education workshops over the years. Still others have participated in state or national energy and resource conservation education organizations. Some may not have had any of these experiences. Regardless of past involvement, a planned program of inservice education for all teachers and administrators is needed if they are to keep up with the latest developments in this field.

An administrator or a district energy and resource conservation committee will sometimes have difficulty finding the time and the financial resources that a comprehensive inservice program requires. These difficulties can usually be overcome by putting together creative and innovative inservice programs of high interest and high quality. One distinct advantage these inservice programs have over most other inservice programs is that they deal with critical issues that are currently impinging on the lives of the teachers, students, and their families. Additionally, many of these inservice activities can be held in naturally pleasing settings and can place participants in highly involving and satisfying activities.

Educators who wish to plan effective inservice programs should carefully consider the following:

- the present skill and knowledge level of participants
- the other expectations or pressures that teachers are experiencing
- the need for the participants to be involved in the planning, scheduling, and implementation of the inservice sessions
- the fact that the sessions need to be practical and consistent with the philosophical direction of the school district
- the realization that substantial competence exists among the educators themselves resulting in positive peer support and acceptance
- the need to orient outside experts thoroughly to the specific methods and activities that are to be conducted
- the realization that inservice education programs need to be long term, include follow-up with individuals, provide positive feedback, raise expectations, result in the changed behavior of the individual

TYPES OF INSERVICE

It should be kept in mind that people change slowly. Patience and persistence are required on everyone's part.

Types of Inservice Activities

The variety of inservice activities is limited only by the creativity of the planners and the limitations of time and cost considerations. The following samples of inservice education activities are only a few of many that are suitable for energy and resource conservation education.

- **University credit courses and workshops**
  - established catalog courses
  - special purpose, locally adapted courses or workshops
- **Governmental agency workshops**
  - hazardous waste by EPA
  - forest ecology by Ohio Department of Natural Resources
  - soil and water conservation practices by soil and water conservation districts
  - recycling by Cooperative Extension Service
- **Make and take workshops**
  - learning centers
  - game construction
  - puzzles
  - measuring equipment, for example, weather instruments
  - teaching aids
- **Pollution control field trips**
  - waste water treatment plant
  - strip mine
  - power plant
  - soil conservation practices site
  - reclamation site
  - recycling center
  - steel mill
  - automobile plant
  - chemical plant
- **Energy and resource field trips**
  - granary
  - freight yard
  - meat packing plant
  - foundry
  - quarry
  - oil and gas well
  - food processing plant
  - power generating plant
  - automobile plant
  - other manufacturing plants

TYPES OF INSERVICE

- **Historical field trips**
  - famous farms
  - historical villages
  - canal restorations
  - steam train rides
  - urban restorations
- **Classroom visitations**
  - in same school district
  - in other school districts
- **Natural environment field trips**
  - parks, preserves, forests
  - lakes, rivers, streams
  - hiking and biking trails
  - white water rafting or canoeing
- **Field trips to nature study facilities**
  - nature centers
  - parks
  - camps
  - outdoor education centers
- **Field trips to animal and plant collections**
  - arboretums
  - zoos
  - natural history museums
  - commercial animal collections
- **Curriculum materials workshops**
  - Project Learning Tree
  - Project Wild
  - energy
  - marine and aquatic
- **Curriculum development workshops**
  - creating new curriculum materials
  - writing a course of study
  - choosing curriculum materials
- **Discussion groups**
  - trends in energy and resource conservation
  - recent research reports
  - innovative programs

TYPES OF INSERVICE

- **Extended field trip or retreat**
  One of the most effective inservice activities is to arrange for a group of educators to live and work together over a period of three to thirty days. Both the leaders and learners have a chance to share deeply held beliefs and values concerning not only energy and resource conservation education issues but also personal and educational philosophies. This informal, long-term relationship often produces observable changes in teacher behavior.

A variety of these inservice activities conducted over several years should be an effective way to improve the skills and knowledge base of educators who are required to carry out a comprehensive K-12 energy and resource conservation education program.

CHAPTER VI

USING NONSCHOOL RESOURCES

One of the positive aspects of the energy and resource conservation education effort is the large number of governmental agencies; local, state and national organizations; business and industrial companies, higher education institutions, and even individuals who are ready to assist school district personnel in many ways. In the past this generous cooperative effort has produced energy and resource conservation education programs of exceptional quality.

The help from these groups and individuals comes in so many forms and quantities that it is difficult to list them all. For starters consider the following:

resource people
- editors
- writers
- artists
- speakers
- volunteers

financial aid
- donations
- money-raising activities
- prizes
- scholarships
- awards

material resources
- printed materials
- films, filmstrips
- equipment
- tools
- building materials
- furniture

services
- planning assistance
- advise
- publicity
- transportation
- inservice sessions
- field trips

Other forms of assistance are surely available if only an appropriate source is found.

Here in Ohio an unusually diverse array of groups and agencies is ready to help. The following list is intended to be suggestive rather than exhaustive. Addresses are given for only the state and national groups.

Village, City, County or Regional Resources

- Ohio Department of Natural Resources (regional personnel)
  - foresters
  - geologists
  - park rangers
  - game protectors
  - water safety officers
  - naturalists
  - soil and water specialists
  - litter control personnel

RESOURCES

- County Soil and Water Conservation District
  - technicians
  - program specialists
- Cooperative Extension Service
  - home economics agents
  - horticultural agents
  - 4-H agents
  - community development agents
  - energy technicians
  - environmental specialists
  - agricultural agents
- Local Departments of Health
  - sanitarians
  - waste water treatment technicians
  - water supply inspectors
  - environmental health technicians
- Utility Companies
- Service Organizations
  - Rotary
  - Sertoma
  - Kiwanis
- Parent and Teacher Groups
- Environmental Groups
  - Sierra Club
  - Audubon Society
  - Izaak Walton League of America
  - National Wildlife Federation
- Sportsmen's Clubs
  - rod and gun clubs
- Youth Groups
  - Boy Scouts
  - Girl Scouts
  - YMCA
  - YWCA
  - Boy's Clubs
- Church Groups
- Nature Centers

State Agency Resources

- Divisions or Offices of the Ohio Department of Natural Resources
  Fountain Square
  Columbus, OH 43224
  - Civilian Conservation
  - Forestry
  - Geological Survey
  - Litter Control
  - Natural Areas and Preserves

RESOURCES

Oil and Gas
Outdoor Recreation Services
Parks and Recreation
Public Information and Education
Reclamation
Soil and Water Conservation
Water
Watercraft
Wildlife

- Divisions of the Ohio Environmental Protection Agency
  361 E. Broad Street
  Columbus, OH 43215
  Air Pollution Control
  Hazardous Material Management
  Land Pollution Control
  Public Water Supply
  Wastewater Pollution Control
  Public Interest Center

- Divisions and Bureaus of the Ohio Department of Health
  246 N. High Street
  P. O. Box 118
  Columbus, OH 43216
  Environmental Health
  Occupational Health

- Ohio Historical Society
  1982 Velma Avenue
  Columbus, OH 43211
  Natural History Division

- Ohio Department of Education
  Division of Elementary and Secondary Education
  65 South Front Street—Room 1005
  Columbus, OH 43215

  Division of Inservice Education
  65 South Front Street, Room 1013
  Columbus, OH 43215

- The Ohio State University Cooperative Extension Service
  2120 Fyffe Road
  Columbus, OH 43210

- Ohio Department of Development
  30 East Broad Street, 24th Floor
  Columbus, OH 43215
  Office of Energy Conservation

RESOURCES

State Organizations

- Aullwood Audubon Center and Farm
  1000 Aullwood Road
  Dayton, OH 45414
- League of Ohio Sportsmen
  4330 Clime Road North
  Columbus, OH 43228
- NASA—Lewis Research Center
  Public Information
  21000 Brookpark Road
  Cleveland, OH 44135
- Nature Conservancy, Ohio Chapter
  1504 West 1st Avenue
  Columbus, OH 43212
- Ohio Academy of Science
  445 King Avenue
  Columbus, OH 43201
- Ohio Alliance for the Environment
  445 King Avenue
  Columbus, OH 43201
- Ohio Conservation and Outdoor Education Association
  208 Alden Avenue
  Marietta, OH 45750
- Ohio Environmental Council
  1500 W. 3rd Avenue
  Columbus, OH 43212
- Ohio Forestry Association, Inc.
  665 E. Dublin-Granville Road
  Columbus, OH 43229
- Ohio Wildlife Federation
  4330 Clime Road North
  Columbus, OH 43228
- Sierra Club, Ohio Chapter
  65 S. 4th Street
  Columbus, OH 43215

National Organizations

- Alliance to Save Energy
  1925 K Street, NW
  Washington, DC 20006

RESOURCES

- American Camping Association, Inc.
  Bradford Woods
  Martinsville, IN 46151
- American Forest Institute
  1619 Massachusetts Avenue, N.W.
  Washington, DC 20036
- American Gas Association
  1515 Wilson Blvd.
  Arlington, VA 22209
- The American Museum of Science and Energy
  Science Education Resource Center
  Oak Ridge Associated Universities
  P.O. Box 117
  Oak Ridge, TN 37830
- American Nuclear Society
  555 North Kensington Avenue
  LaGrange Park, IL 60525
- American Petroleum Institute
  Educational Services
  1220 L Street, Northwest
  Washington, DC 20005
- Atomic Industrial Forum, Inc.
  Publications Office
  7101 Wisconsin Avenue
  Washington, DC 20014
- Defenders of Wildlife
  2000 W. Street, N.W.
  Suite 201
  Washington, DC 20036
- Ducks Unlimited,Inc.
  National Headquarters
  P. O. Box 60666
  Chicago, IL 60666
- Edison Electrical Institute
  1111 19th St., N.W.
  Washington, DC 20036
- Electric Power Research Institute
  P.O. Box 10402
  Palo Alto, CA 94303

RESOURCES

- Energy Source Education Council
  Program Distribution Office
  5505 E. Carson, Suite 250
  Lakewood, CA 90713
- Isaak Walton League of America
  1800 North Kent Street
  Suite 806
  Arlington, VA 22209
- National Audubon Society
  950 Third Avenue
  New York, NY 10022
- National Coal Association
  1130 17th Street
  Washington, DC 20036
- National Solar and Heating and Cooling
  Information Center
  P.O. Box 1607
  Rockville, MD 20850
- National Wildlife Federation
  14132 16th St., N.W.
  Washington, DC 20036
- The Nature Conservancy
  Suite 800, 1800 N. Kent Street
  Arlington, VA 22209
- Oak Ridge Associated Universities
  P.O. Box 117
  Oak Ridge, TN 37830
- Thomas Alva Edison Foundation
  143 Cambridge Office Plaza
  18280 West Ten Mile Road
  Southfield, MI 48075
- U.S. Department of Energy
  1000 Independence Avenue, S.W.
  Washington, DC 20585
- The Wildlife Society
  Suite S-1076
  3900 Wisconsin Avenue
  Washington, DC 20036

RESOURCES

- Zero Population Growth
  Suite 603
  1346 Connecticut Avenue
  Washington, DC 20036

Federal Agencies

- Department of Agriculture
  14th Street & Jefferson Dr., S.W.
  Washington, DC 20250
  - U.S. Forest Service
  - Soil Conservation Service
- Department of Energy
  P. O. Box 62
  Oak Ridge, TN 37830
  - Technical Information Center
- Department of Interior
  Interior Building., C St., N.W
  Washington, DC 20240
  - U. S. Fish and Wildlife Service
  - Bureau of Land Management
  - Bureau of Reclamation
  - National Park Service
- Environmental Protection Agency
  1129 20th St., N.W.
  Washington, DC 20013
  - Office of Public Affairs

SUMMARY

CHAPTER VII
SUMMARY

Developing a kindergarten through grade twelve energy and resource conservation education program can be a rewarding experience. The writing of a narrative program philosophy, the development of comprehensive program goals, and the translation of the goals into program and subject objectives require research, discussion, and cooperative decision making. This involvement among teachers, instructional leaders, curriculum specialists, and administrators promotes a more thorough understanding of the critical importance of environmental education in the total school curriculum.

When the course of study is completed, the next step is choosing appropriate learning activities, teaching strategies, and learning materials. A dynamic inservice education program will increase the effectiveness of the energy and resource conservation program. The reward will be enthusiastic students practicing energy and resource conservation at home, in school, and in the community.

The Ohio Department of Education has encouraged environmental education since 1939 when the first consultant was employed to help school district personnel include conservation education activities in the school curriculum. Now, forty-six years later, this publication is the latest of many efforts to move environmental education forward. The dedication of Ohio educators in improving energy and resource conservation in Ohio schools is much appreciated.

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APPENDIX A
BIOGRAPHICAL SKETCHES

The biographical sketches included in this appendix focus on only a few of the hundreds of people who have made significant contributions to the conservation and environmental education movement nationally or in Ohio. Hundreds of other scientists, inventors, technologists, engineers, and specialists from many fields have made significant contributions to an understanding of the world environment and the identification and solution of environmental problems. Students will find a gold mine of facts and points of view. Space does not permit a longer list. Please add your favorites.

John J. Audubon (1785—1851)

John James Audubon was and still is America's most famous ornithologist. His paintings of American birds are famous for both their scientific accuracy and their pleasing beauty. The present day Audubon Society, which deals with a wide range of conservation issues, is named after John James Audubon. He is the author of *Birds of America*, *A Synopsis of the Birds of North America*, and *The Viviparous Quadrupeds of North America*. Further reading: *Audubon the Naturalist*, Francis Hobard Herrick.

Hugh Hammond Bennett (1881—1960)

Hugh Hammond Bennett, after working several years for the U.S. Bureau of Soils, was one of the first conservationists to predict the seriousness of soil erosion and related phenomena, and to educate American leaders and citizens concerning these problems. Among other places, Bennett taught at The Ohio State University. Among his many publications are *Theory and Practices in the Use of Fertilizer and Soil Conservation*. For further reading: *Big Hugh: The Father of Conservation*, Wellington Brink.

David Ross Brower (1912—)

David Brower is a well-known conservationist-political activist who has fought for such legislation as The Wilderness Act and against such issues as nuclear proliferation. Among other positions he has served as director of The John Muir Institute, president of Friends of the Earth, and officer of Trustees for Conservation. He fought to keep the Grand Canyon free of utility dams and to preserve other national parks. He has edited many publications such as *Gentle Wilderness*, *The Sierra Nevada*, and *The Sierra Club Wilderness Handbook*.

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John Burroughs (1837—1921)

As a very successful and popular nature essayist, John Burroughs published many collections during his lifetime that introduced many people, especially the young, to the joys of nature. His first works, such as *Wake Robin, Winter Sunshine,* and *Notes on Walt Whitman,* were completed during Burroughs' lonely years as a vault guard for the Treasury Department. Burroughs is more often described as a nature artist rather than activist. His works are peaceful and entertaining and lack personal injections of morality or appeals for preservation.

Reynold E. Carlson (1901—)

For the first ten years of his life, Rey Carlson called Minnesota his home. A move to California presented the opportunity to study at the University of California at Berkeley and at Stanford University. His outstanding career as an educator began in California where he served five years as an elementary and high school teacher. After that, he held an elementary school principalship. As a staff member of the National Recreation Association, Rey Carlson had the opportunity to influence and interact with professionals throughout the country. He was a faculty member of New York University's National Camp, the first outdoor teacher education program in the U.S. In 1947 he began a distinguished twenty-five year association with Indiana University. One of his many major projects which began in the early 1950s was the establishment and development of Indiana University's Bradford Woods Outdoor Education and Recreation Center. Rey Carlson served on many commissions, task forces, committees, and organization boards at both the state and national levels. He served as president of the American Camping Association and was a driving force in the establishment of the Association of Interpretive Naturalists (he is considered its cofounder). In 1963 he received the Distinguished Teaching Award from Indiana University. He received an honorary Doctor of Humanics from Springfield College in 1976 and an honorary Doctor of Humane Letters from Indiana University in 1983. A prolific writer, Rey Carlson may be best known as a coauthor of *Recreation in American Life,* published in 1972, and for his coauthorship of *Outdoor Education,* also published in 1972, with Julian Smith, George Donaldson, and Hugh Masters.

Rachel Carson (1907—1964)

Rachel Carson's *Silent Spring,* which stressed the harmful effects of chemical pesticides on the earth's delicate ecosystem, is often credited with prompting the third conservation movement that

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began in the 1960s. Nature writer and scientist, Carson also wrote such successful publications as *The Sea Around Us* and *Under the Sea Wind*. Trained in zoology and marine biology, Carson worked for several years for the U.S. Fish and Wildlife Service. Further information: *The House of Life: Rachel Carson at Work* by Paul Brooks.

Barry Commoner (1917—)

Barry Commoner is a biologist-ecologist who is credited with arousing public concern over the degradation of Lake Erie in the 1960s. Commoner stressed all social issues in the 1960s, including poverty, war, and racism, yet placed special emphasis on environmental and ecological problems. He authored *The Closing Circle* and further information can be found in this and his other works such as *The Politics of Energy* and "Beyond the Teach-In."

Jacques Yves Costeau (1910—)

Jacques Costeau had a distinguished career in the French navy in World War II earning numerous military decorations. His education included earned degrees from both French and American universities. His books, films, television documentaries, and articles have earned him awards and recognition worldwide. He was partly responsible for the invention of the aqualung. In 1981 he wrote *The Costeau Almanac of the Environment*. Currently, he is associated with the Costeau Society in New York City.

Black Elk or Hehaha Sapa (1863—193?)

Black Elk was born in December of 1863. He was an Oglala, a division of the Teton Dakota. He knew Tatanka Yotanka (Sitting Bull) and Mahpiualuta (Red Cloud), and was a relative of Chief Crazy Horse. Black Elk, whose father was a medicine man, and several of his brothers studied the sacred traditions of his people with the great priests who recognized his unique spiritual power. He was present at the Battle of the Little Big Horn, traveled with Buffalo Bill in Europe, danced for Queen Victoria, but is best known for his autobiography, *Black Elk Speaks*. This book had a cult following in the 1960s and is revered by the Sioux as their bible. This book was one of the first to share the Native Americans' sacred views and philosophies on life and nature.

Ralph Waldo Emerson (1803—1882)

Ralph Waldo Emerson is often credited as being the father of the 19th century Intellectual Transcendentalist Movement, which had its roots in Concord, Massachusetts. Emerson wrote the famous essay

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"Nature" that influenced many people, among them Muir, Burroughs, Thoreau, and Austin. Further information can be found in *Ralph Waldo Emerson: A Biography* by Gary Wilson Allen.

Donald R. Hammerman (1929—)

Donald Hammerman has spent his career in outdoor education and outdoor teacher education. He is active in state and national organizations and has authored many books and articles. He was the force behind the development of Northern Illinois University's world-recognized outdoor teacher education program. His *Teaching in the Outdoors* is considered a classic.

Garret Hardin (1915—)

Dr. Garret Hardin is a professor of ecology at The University of California. His writings, which include "We Live on a Spaceship," "The Tragedy of the Commons," and *Limited World, Limited Rights*, have helped to enlighten the American public to the problem of overuse of resources and to the Earth's limited capacity to assimilate an unchecked growing population.

Aldo Leopold (1886—1948)

Because of his eighteen years of service in the USDA Forest Service and his contributions to the complex study of natural ecosystems with emphasis on animal life, Aldo Leopold is known as one of the fathers of game management. In such works as *Game Management*, *A Sand County Almanac*, and "A Biotic View of the Land," Leopold stressed the need to stop exploiting game and other natural resources and to begin treating them with respect and prudence. Further information: *Thinking Like a Mountain* by Susan Flader.

George Perkins Marsh (1801—1882)

A native of Vermont and recipient of a law degree, George Perkins Marsh served his state as a legislator and later was assigned by President Lincoln as American minister to Turkey and Italy. Throughout his life, however, Marsh remained dedicated to the protection of the environment and stressed the need for wise scientific management of natural resources. His *Man and Nature* provides one of the first accounts concerning the effects of human action on soil, water, wildlife, and forestry. *George Perkins Marsh, Versatile Vermonter* by David Lowenthal provides further information.

William John McGee (1853—1912)

William John McGee was very influential in Theodore Roosevelt's

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administration, serving as the scientific arm of the ongoing conservation movement and righthand man to Gifford Pinchot. McGee was one of the first persons to see the need to manage natural resources as dependent and interrelated facets instead of as independent disconnected ones. He was invited by Powell to work for the U.S. Geological Survey. Among other works, McGee authored "The Conservation of Natural Resources" and *Wells and Subsoil Water.*

John Muir (1838—1914)

John Muir is best known for his ardent and uncompromising fight for wilderness preservation, especially in the West. Nature activist first and writer second, Muir published essays in many eastern journals, such as *The New York Daily Tribune*, describing the Sierra Nevadas, Yosemite Valley, and other unique natural areas and advocating their preservation. With this theme in mind, Muir became the founding father and first president of the Sierra Club in 1892. Together with Robert Underwood Johnson, Muir led the successful fight to establish Yosemite Valley as a national park; however, he lost his later battle to prevent the damming of its Hetch Hetchy Valley. By the end of his career, Muir had entertained and influenced such prominent conservationists as Theodore Roosevelt, Gifford Pinchot, and John Burroughs.

Gaylord Anton Nelson (1916—)

During his many years of public service in his native state of Wisconsin and during his seventeen years as a U.S. Senator, Gaylord Nelson, with his dedication to environmental issues, served on many committees and fought continuously for legislation designed to protect the environment. In 1981 Nelson was appointed chairman of the Wilderness Society. He is the author of the well-known *America's Last Chance.*

Frederick Law Olmsted (1822—1903)

Frederick Law Olmsted is best known for his contribution to the field of landscape architecture and his promotion and design of city parks. Later, as head of the Yosemite Park Commission, he conducted an in-depth study of the park's management needs especially in regard to visitor control. He is the author of *Walks and Talks of an American Farmer in England* and *The Cotton Kingdom.* Further reading: *FLO: A Biography of Frederick Law Olmsted* and *Park Maker: A Life of Frederick Law Olmsted* by Elizabeth Stevenson.

Gifford Pinchot (1865—1946)

Gifford Pinchot was a native of Connecticut and a graduate of Yale

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College and the famous Biltmore Forestry School. He served as Chief of the Division of Forestry in the USDA and was the backbone behind Theodore Roosevelt's successful conservation crusade. During his many years of public service, Pinchot served on numerous conservation-related groups, such as the Inland Waterways Commission and the Public Lands Commission, and also headed the first national inventory of the United States' natural resources. He is the author of *A Primer of Forestry* and *The Fight for Conservation.* Further reading: *Gifford Pinchot, Forester-Politician* by M. Nelson McGreary.

John Wesley Powell (1834—1902)

After serving as a major in the Civil War for the Union Army and losing his right arm while doing so, John Wesley Powell took to exploring the Western Plains, the Grand Canyon, and The Rocky Mountains. He successfully completed a 900-mile boating exploration of the Grand Canyon and also conducted the first detailed study concerning the irrigation needs of much of the West. This study found in his *Report on the Lands of the Arid Region of The United States.* He is also author of *Explorations of the Colorado River of the West and Its Tributaries.* Further reading: *The Man Who Rediscovered America: A Biography of John Wesley Powell* by John Upton Terrell. Powell was later appointed Head of the U.S. Geological Survey.

Thomas J. Rillo (1927—)

New Jersey was the location of Thomas Rillo's early life and education. After seven years as a high school teacher, he began teaching at the university level. He has been associated with Montclair State College, Southern Illinois University and Glassboro State College. Presently, he is professor of outdoor education at Indiana University. Much of his interest in and knowledge about outdoor education came as a result of his long association with Dr. L. B. Sharp. During more than thirty years as an educator, Dr. Rillo has received many awards and honors and has been a prolific writer, having had over fifty items published. He has been associated with nearly twenty state and national conservation, natural history, and outdoor education organizations. His leadership has been outstanding as a committee chairperson, organizational board member, and consultant. His special influence has been recognized by numerous graduate students who have studied under him.

Franklin D. Roosevelt (1882—1945)

As President of the United States, Franklin Delano Roosevelt was especially dedicated to conservation. Along with other New Deal

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programs, he established the Civilian Conservation Corps and the Tennessee Valley Authority. The latter not only created jobs but also helped to protect, rebuild, and improve the national forests, parks, and wilderness areas of the United States. Roosevelt also set up public work programs to alleviate soil erosion and renamed the Soil Erosion Service the Soil Conservation Service. Further reading: *Franklin D. Roosevelt and Conservation* by Anna Lou Riesch.

Theodore Roosevelt (1858—1919)

With the aid of Gifford Pinchot and W. J. McGee, Theodore Roosevelt allocated millions of acres of land to the public domain, where he felt it would be managed wisely and for all people. Subsequently, however, Congress revoked The Forest Reserve Act to halt his conservation crusade, which many feel today to be his biggest contribution while in public service. While not in office, Roosevelt was a naturalist, bird lover, taxidermist, and big game hunter. His writings include *Hunting Trips of a Ranchman* and *The Wilderness Hunter*. More information can be found in Paul Brook's *Speaking for Nature*.

L. B. Sharp (1895—1963)

A Kansas farm background permitted Lloyd Sharp to fish, hunt, trap, and wander the land. These adventures developed his great appreciation for the environment. His early Kansas education coupled with his Columbia University graduate studies, leading to the Ph.D., gave him the skills needed to revitalize *Life* magazine's summer program for underprivileged New York City children. Starting in 1924, a renamed Life Camps program slowly began to see the impact of this forward-thinking man. This association continued for more than 25 years, stretching into the 1950s. During these years and until his death, L. B. Sharp influenced the course of camping and outdoor education in the U.S. In 1940 he started National Camp to provide camping educators an opportunity to learn better methods. In 1951 he founded the Outdoor Education Association. In 1960 he moved to Southern Illinois University to continue his work and help start their Outdoor Education Center. His many articles and reports delineate his educational philosophy. Perhaps his best known work was a book he edited, *Extending Education Through Camping*, published by Life Camps, Inc., in 1948.

Paul Allman Siple (1908—1968)

Polar explorer, author, and geographer Paul Allman Siple is honored for his difficult and courageous explorations of polar areas. He was highly instrumental in contributing polar artifacts to the Museum of

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Natural History and also in mapping arctic areas. He was awarded sixty merit badges during his lifetime and authored such works as *Exploring at Home, Scout to Explorer,* and *The Second Byrd Antarctic Expedition—Botany Report.*

Julian W. Smith (1901—1975)

Julian Smith is acknowledged by many as the father of Outdoor Education in the United States. His long tenure at Michigan State University and his many years as the director of the Outdoor Education Project for the American Alliance for Health, Physical Education, Recreation, and Dance made him a well-known expert both in the United States and Canada. Awards and recognitions were bestowed on Julian Smith by dozens of public and private groups. He served on many prestigious boards and was an officer at both the state and national levels. In 1963 the book *Outdoor Education* was published with Julian Smith listed as the senior author. A revised edition appeared in 1972.

Henry David Thoreau (1817—1862)

As a transcendentalist, Henry David Thoreau found happiness and spiritual revival only when in communion with nature. Thoreau spent his afternoons walking in the country that surrounded his Concord, Massachusetts home and entering his observations into his eventually extensive journals. Thoreau, in both word and practice, stressed the essentiality of simplifying one's life in order to avoid the desperation caused by wanting ever more wealth and material luxury. Thoreau's retreat to Walden Pond for two years of rather primitive living provided the basis of his book *Walden.* However, only after his death did Thoreau's writings and philosophies become prominent in nature study.

Rolling Thunder (—)

Hopi teachings tell about the time when white people would share certain characteristics of traditional native peoples. The signs of this new era would be long hair, personal styles of clothing and language, peaceful natures, and a holistic sense of identity with nature. The people were to be called by a name similar to the Hopi. The Hopi felt the hippies of the sixties marked the beginning of this era. This era would allow the views of the white man and native American peoples to be shared. In this era native peoples could begin to come forward to share holistic views of nature and sacred philosophies never before revealed. Four messengers were sent to help these persons and their movement. One of these messengers was a Cherokee medicine man,

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Rolling Thunder. This Indian medicine man, spiritual leader, philosopher, and spokesman for the Cherokee and Shoshone tribes has since been studied by the Menninger Foundation and has given great insight into the holistic Indian approaches to medicine, nature, and philosophy.

Stewart L. Udall (1920—)

Stewart Udall is a native of Arizona and represented his state in the U.S. House of Representatives before being appointed Secretary of the Interior by John F. Kennedy. Udall is well known for his political contributions to environmental conservation. He is the author of *The Quiet Crisis*, a thought-provoking look at the history of the American environment and changing attitudes toward it. Further information can be found in *"Stewart Udall"* by Richard Sterns.

OHIOANS

Charles Arthur Dambach (1911—1969)

A native of Cleveland, Ohio, and graduate of The Ohio State University, Charles Dambach was an active and highly successful local conservationist. Besides serving as regional biologist for the U.S. Soil Conservation Service, he was director of conservation curriculum and director of The School of Natural Resources at The Ohio State University for several years. Dambach was chief of the Wildlife Division at the Ohio Department of Natural Resources, served on the Great Lakes Fish Commission, and was a trustee for the Ohio Conservation Fund. He is the author of *Conservation—Materials Conservation, A Survey of Printed Materials for Conservation*. Further information: *Who's Who In America*.

Kenneth Whitten Hunt (1909—)

Massachusetts State College, Williams College, Cornell University, and Yale University provided Dr. Hunt's extensive formal education. He taught at several universities before coming to Antioch College in 1946 as director of Glen Helen. During his twenty-seven years in Ohio, he was closely associated with many aspects of the movement to preserve natural areas including an extensive involvement in outdoor conservation and environmental education. He may be best known for successfully preventing encroachment on the 1000-acre Glen Helen preserve by both a highway construction plan and a sewer line and disposal plant in the 1950s. Dr. Hunt has received many recognitions including election to the Ohio Conservation Hall of Fame. He is now located at Chapel Hill, North Carolina.

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Robert R. Finlay (1905—)

John Marshall High School in Cleveland was one of only three schools in Ohio offering a course in the conservation of natural resources in 1952. After teaching that course for several years, Bob Finlay joined the Ohio Department of Education. During Finlay's eighteen years with the department, he planned and conducted hundreds of teacher workshops in conservation education. Another responsibility was with the Ohio Conservation Laboratory, a summer workshop for teachers, sponsored by four Ohio universities and the Ohio Department of Education. After serving on the faculty for several years, he became the assistant director and later the codirector of the laboratory. Hundreds of Ohio's educators were touched by Bob's love of conservation education. School camping (resident outdoor education) and school land laboratories were successfully nurtured under Bob's direction. Finlay was also involved in the founding of the Ohio Conservation and Outdoor Education Association. He has been active in many other conservation organizations and community groups. He presently lives in Columbus, Ohio.

Carl S. Johnson (1915—1985)

As a Minnesota native who had Norwegian ancestors, Carl Johnson was naturally interested in forestry and natural resources. While still in graduate school at The Ohio State University, he served one year as the supervisor of conservation education for the Ohio Department of Education. During that year he conducted teacher workshops in six counties and was responsible for upgrading many previously established school forests. He became a member of the faculty of the Ohio Conservation Laboratory in 1951, leading to an eight-year term as its director. Carl Johnson was one of the original members of the faculty of the School of Natural Resources at The Ohio State University. He served as the director of Ohio State University's Barnebey Center for Environmental Studies from 1970-1979. He was one of the founders of the national Conservation Education Association and The Ohio Conservation and Outdoor Education Association. His awards and recognitions were extensive.

Ruth Wertenberger Melvin (1909—)

Ruth Melvin has dedicated a major part of her life, both professionally and personally, to the field of environmental education. Her formal education in sociology and geology gives her a broad understanding of the human and built environments and a scientific perspective of the natural environment. Her teaching has led her to be associated with Capital University, the Audubon Society, and the American Nature Study Society. She has been extensively involved

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in state and national groups including The Ohio Alliance for the Environment, The Ohio Academy of Science, the Ohio Natural Areas Council of the Ohio Department of Natural Resources, and the Ohio Chapter of Nature Conservancy. Two of her publications are *Ohio Environmental Education Areas* and *A Guide to Ohio Outdoor Education Areas*. She is an elected member of the Ohio Conservation Hall of Fame. She now resides in Delaware, Ohio.

Ralph E. Ramey (1928—)

For more than thirty years since his graduation from The Ohio State University, Ralph Ramey has been closely associated with activities in natural history and natural resources. He is an excellent photographer and avid outdoorsman. He has been active as a board member and officer in many conservation organizations. A past president of the Ohio Chapter of Nature Conservancy and an honorary life trustee, Ramey has received the chapter's Achievement Award and the national organization's Green Leaf Award. He also served on the Ohio Natural Areas Council from 1974 through 1985. Generating grassroots support for the prevention of natural habitat destruction and for passage of natural area legislation has been a significant area of involvement for him. He presently resides in Yellow Springs, Ohio.

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CURRICULUM RESOURCES

- Bachart Jr., Russell E., and Emerson L. Snooks. *Outdoor Education Equipment.* Interstate, 19-27 N. Jackson St., Danville, IL 61832. 1974.
  This reference describes how to construct a wide variety of equipment useful in outdoor investigations. Simple directions, illustrations and easily obtainable materials make this book an excellent reference for both children and adults.

- Canfield, Jack, and Harold C. Wells. *100 Ways to Enhance Self-Concept in the Classroom.* Englewood Cliffs, NJ: Prentice-Hall, Inc. 1976.
  The authors have compiled some of the most gentle, most instantly useful and gripping exercises, strategies and techniques ever put between the covers of a book. Their long experience with the humanistic education movement and their dedication to the notion that positiveness makes people grow illuminate every page. Teachers will find the concise clarity of the descriptions of each strategy almost magical. (Abridged from the foreword by Sidney Simon)

- Cornell, Joseph Bharat. *Sharing Nature with Children.* Ananda Publications, 900 Alleghany Star Rd., Nevada City, CA 95959. 1979.
  This assortment of nature education activities and games involves direct experiences. The book stresses that the activities require no complicated equipment and no special expertise on the part of the adult leader. All that is needed is a sensitivity to nature and people.

- *Energizers.* Lincoln, MA: Public Information Office, Massachusetts Audubon Society, 01773, 1985, $6.00.
  This guide lists energy education materials for grades 6-8. Items are reviewed and information for obtaining them is included.

- *The Environment and Technology Project.* Dr. Barbara A. Barchi, Director, 1633 North Burling, Chicago, IL 60614
  This high school level program is designed to generate concern regarding the environment and technology in our nation and neighborhood. It is organized around societal issues and enables students to apply science and social studies knowledge to the resolution of local problems.

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- Hoessle, Kirk and Steve Van Matre. *Earth Magic* and *Snow Walk*, Institute for Earth Education, P.O. Box 228, Warrenville, IL 60555. 1980.

  These two booklets blend activities based on the acclimatization philosophy into two, hour-long walks. The activities offer participants a fresh way of looking at familiar things or an interesting introduction to worlds of nature never before experienced. The acclimatization walks provide a vehicle for leaders interested in a discovery-oriented medium that promotes sensing, empathizing and sharing. *Snow Walk* is most useful in the winter, while *Earth Magic* could be used during other seasons. Each walk packet is sold separately.

- "An Introduction to Population Dynamics" (A Teaching Kit). Population Reference Bureau, 2213 M Street NW, Washington, DC $17.50

  Visual aids, essays, wall charts, posters, glossary, and a student chartbook make this a usable resource. It also contains a teacher's guide to help with the lessons on population fundamentals, migration, population growth, urbanization, future trends, and more.

- *Outlook: Environmental Education Enrichment*. Des Moines, IA: Iowa Department of Public Instruction. 1983.

  This series of four packets of activity cards provides concise directions for thirty-six interesting learning activities for each grade level group: K-2, 3-5, 6-8 and 9-12.

- Knapp, Clifford E., and Joel Goodman. *Humanizing Environmental Education*. Martinsville, IN.: American Camping Association. 1981.

  The authors have been involved in camp and school programs where respect for self and others, trust and caring, cooperation and a sense of community are explored. This book will tell you how to teach and encourage interpersonal rapport, openmindedness and curiosity; a sense of values (personal, social, and environmental); feelings of self-worth and confidence; and a community spirit among children and adults alike. The book artfully weaves together activities that expand consciousness of ourselves and of the natural world around us at the same time. (Abridged from the forewords by Joseph Cornell and Jack Canfield)

- *Naturescope*. National Wildlife Federation, 1412 Sixteenth St., N.W., Washington, DC 20036

  Naturescope is a periodical designed to improve the teaching of nature and natural science, primarily for elementary grades. A one year subscription is $18.

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- *Oceanic Education Activities For Great Lakes Schools* (OEAGLS). Ohio Sea Grant Program, The Ohio State University, Columbus, OH 43210. Undated.

  These nearly two dozen activities are written for grades 5-9. They focus on the role of the oceans and the Great Lakes in the lives of Ohioans and include economic, political, social, scientific, and technological considerations. Subject areas include art, geography, history, language arts, math, music, science, and social studies.

- *Outdoor Biology Instructional Strategies* (OBIS). Delta Education, Inc., Box M, Nashua, NH, 03061-6102, 1975.

  This program, designed for youngsters ages 10-15, promotes the understanding of ecological relationships. Packaged into sets of 24 folios, the hands-on activities emphasize the managed environment. Flexibility allows for adaptations. These materials were developed by Lawrence Hall of Science at the University of California, Berkeley.

- Pepi, David. *Thoreau's Method: A Handbook for Nature Study.* Prentice Hall, Inc. Englewood Cliffs, NJ. 1985.

  The book is divided into two parts: SKILLS and EXCURSIONS. Moth study, goldenrod ecosystems, and bog study are just a few of the items included.

- *Resource Guide to Educational Materials About Agriculture: A Project of Agriculture in the Classroom.* Agriculture in the Classroom, Room 536 A, U.S. Department of Agriculture, Washington, DC, 20250.

  This excellent list of resources includes print and audiovisual materials covering diverse topics. Suggested grade level use, a description, basic concepts covered, and ordering information are given for each item.

- Simon, Sidney B., Leland W. Howe, and Howard Kirschenbaum. *Values Clarification.* A Handbook of Practical Strategies for Teachers and Students. Dodd, Mead and Co., 75 Madison Ave., New York, NY 10016, 1972.

  Values clarification is not concerned with the content of a person's values, but rather with the process of valuing and how a person comes to hold a certain value. The strategies listed in this and other values clarification books provide useful ideas.

- *The Sourcebook: Learning by Design.* The American Institute of Architects, 1735 New York Avenue, NW, Washington, DC, 20006-5292. 1981.

  This looseleaf book contains sources of environmental education activities, model programs, an annotated bibliography, and

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a listing of people and organizations serving environmental education.

- Stapp, Wm. B. and Dorothy A. Cox. *Environmental Education Activities Manual.* 32493 Shady Ridge, Farmington Hills, MI. 48018, 1974.

  This complete K-12 environmental education program helps students become environmentally aware and responsible citizens. Skill-developing activities focus on problem solving, values clarification, and school-community environmental issues.

- Swan, Malcolm D. *Tips and Tricks in Outdoor Education.* Interstate Printers, 19-27 Jackson St., Danville, IL 61832. 1970.

  A variety of activities on outdoor education topics are presented. A sample worksheet and detailed instructions are given for most activities. Areas covered include animal studies, geology, mapping, plants, and water.

- Van der Smissen, Betty and others. *A Leader's Guide to Nature Oriented Activities.* Iowa State University Press, South State Ave., Ames, IA 50010. 1977.

  Information on programming, as well as extensive sections on nature crafts, games, and outdoor living skills, is included. A good reference for resident outdoor education personnel.

- Van Matre, Steve. *Acclimatization.* Institute for Earth Education, P.O. Box 228, Warrenville, IL 60555. 1972.

  This book represents a sensory and conceptual approach to ecological involvement. It is designed to help people of all ages build an awareness and understanding of themselves and the natural world.

- ———. *Acclimatizing.* Institute for Earth Education, P.O. Box 228, Warrenville, IL 60555. 1974.

  This book explains how to help people personalize experiences. It provides techniques that can break down barriers to awareness while encouraging motivation.

- ———. *Sunship Earth.* Institute for Earth Education, P.O. Box 228, Warrenville, IL 60555. 1979.

  A carefully structured and ordered program is outlined for a five-day resident camp. The emphasis is on providing the larger picture, and looking at natural systems and how people are a part of those systems. The program is based on the acclimatization philosophy of direct involvement.

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- ———. and Bill Weiler. *The Earth Speaks.* Institute for Earth Education, P.O. Box 228, Warrenville, IL 60555.

  This newest book continues the development of the acclimatization philosophy.

- Wheatley, John and Herbert L. Coon, eds. *Teaching Activities for Environmental Education.* Volume III. ERIC Center, 1200 Chambers Road, Columbus, OH 43212, 1975.

  This third volume of 154 activities covers grade levels K to 12. Activities appropriate for all major curriculum areas are included. Each activity includes its original source, grade level, purpose, and concept, and detailed directions. Other books in this series are excellent.

- Western Regional Environmental Education Council and American Forest Institute. *Project Learning Tree: Supplementary Activity Guide for Grades K through 6.* 1977.

  This book of 89 activities and a companion volume for grades 7 through 12 have received enthusiastic acceptance nationwide. Materials can be received only by attending a workshop. Contact the environmental education consultant at the Ohio Department of Education for further information. Division of Elementary and Secondary Education, Room 1005, 65 South Front Street, Columbus, OH 43215.

- Western Regional Environmental Education Council and Western Association of Fish and Wildlife Agencies. *Project Wild.* 1983.

  This book of 81 activities and a companion volume for grades seven through twelve have been well received. Materials can be received only by attending a workshop. Contact the science education consultant in the Division of Inservice Education, Ohio Department of Education, Room 1013, 65 South Front Street, Columbus, OH 43215.

NOTE: Computer software has not been included in this list of curriculum resources because of the rapidly changing technology. Current lists of materials may usually be obtained from catalogs.

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Contributors

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